IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF:
Ramey et al

SERIAL NO.: 10/626,223 **EXAMINER:** Phuongchi T. Nguyen

FILED: July 24, 2003 **ART UNIT:** 2833

FOR: LAND GRID ARRAY CONNECTOR

ATTORNEY DOCKET NO.: A4-008 US

APPEAL BRIEF FOR APPLICANTS

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicants: Ramey et al

Application: LAND GRID ARRAY CONNECTOR

Serial No.: 10/626,223

Filing Date: July 24, 2003

Art Unit: 2833

Examiner: Phuongchi T. Nguyen

Case: A4-008 US

APPEAL BRIEF FOR APPLICANTS

This is an appeal from a final rejection of claims 1-17 that are pending in the present application. The final rejection was made in an Official Action issued in connection with the present application on December 29, 2004, from which a Notice of Appeal was mailed on April 26, 2005 and was received by the Patent Office on April 29, 2005. In accordance with 37 C.F.R. § 1.192(c)(9), the claims pending in the present application and involved in this Appeal are set forth in the attached Appendix A.

I. REAL PARTY IN INTEREST

The real party in interest is Molex Incorporated, having a place of business at 2222 Wellington Court, Lisle, Illinois 60532. Molex Incorporated is the real party in interest by virtue of an Assignment executed by the applicant on July 23, 2003 and recorded in connection with the present application in the United States Patent and Trademark Office on July 24, 2003 on Patent Reel No. 014345, Frame No. 0670.

II. RELATED APPEALS AND INTERFERENCES

Applicant and Molex Incorporated, the assignee of the present application, is not aware of any other appeals or interferences which will directly affect or be directly

affected by or have a bearing on the Board's decision in this appeal of the present application.

III. STATUS OF THE CLAIMS

The status of the claims in the present application is as follows:

1. Total claims: 1-17.
2. Claims canceled: None.
3. Claims withdrawn from consideration but not canceled: None.
4. Claims pending: 1-17.
5. Claims allowed: None.
6. Claims objected to: None.
7. Claims rejected: 1-17.
8. Claims appealed: 1-17[1].

IV. STATUS OF AMENDMENTS

The applicant did not file an Amendment Under 37 C.F.R. § 1.116 in response to the December 29, 2004 Official Action finally rejecting claims 1-17.

V. SUMMARY OF THE INVENTION

A. Background

Land grid array connectors are commonly used with integrated circuits. Conventional land grid array connectors include an insulative housing which defines a plurality of passageways therethrough, and a plurality of conductive contacts received in the passageways. The land grid array connector is connected to an integrated circuit which has a plurality of flat contact pads formed on a bottom surface thereof to which the contacts are electrically mated.

A mating component, such as a printed circuit board, a plate having a contact pad thereon, or an integrated circuit package, is typically mated with the land grid array connector by lowering the mating component onto the land grid array connector such that the conductive contacts are compressed within the housing.

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1 In the Notice of Appeal, applicants inadvertently left out a request to appeal claim 8. Applicants hereby request that claim 8 also be the subject of this appeal.

Problems can occur, however, when the mating component is mated with the land grid array connector. For instance, if the mating component contacts the conductive contacts without an equal force across the entire land grid array connector, lateral forces can be placed on some or all of the conductive contacts such that the conductive contacts can plastically deform. Such a situation could damage the land grid array connector such that replacement of the connector would be necessary. Such a situation could further affect the desired signal transmission.

2. The Invention Of The Present Application:

The present invention provides a land grid array connector 20. The land grid array connector 20 is formed from an insulative housing 22 which has a plurality of passageways 24 provided therethrough and a conductive contact 26 mounted in respective passageways 24. The contacts 26 are mounted in the housing 22 such that a high-density configuration is provided. The contacts 26 are protected by the housing 22 from damage when a lateral force is applied to the contact 26.

The structure of one of the contacts 26 is described herein with the understanding that the other contacts 26 are identically formed. The contact 26 is formed from a conductive material, such as metal, and can be formed by stamping and forming. As such, the contact 26 can be economically manufactured. The contact 26 is formed in generally an "S" shape as shown in FIG. 4. The contact 26 includes a first or upper portion 28, a second or middle portion 30 and a third or lower portion 32. The upper portion 28 can be deformed relative to the middle and lower portions 30, 32 such that the upper portion 28 can move vertically or laterally relative to the middle and lower portions 30, 32. The "S" shape of the contact 26 minimizes translation of the contact 26 when a vertical or lateral force is placed thereon.

The upper portion 28 of the contact is formed by a first part 52 which extends from the first section 50, a second part 54 which extends from the first part 52, a third part 56 which extends from the second part 54, a fourth part 58 which extends from the third part 56, a fifth part 60 which extends from the fourth part 58, and a sixth part 62 which extends from the fifth part 60. The first part 52 curves upwardly from the first section 50 and extends in the same direction as the lower portion 32 of the contact 26. The second part 54 extends upwardly from the first part 52 and is angled relative to the horizontal as shown in FIG. 4. In addition, the second part 54 angles relative to the vertical toward the first side 42 of the

middle portion as is most clearly shown in FIG. 5. The third part 56 is generally U-shaped. The fourth part 58 extends upwardly from the third part 56 and is angled relative to the horizontal as shown in FIG. 4. In addition, the fourth part 58 angles relative to the vertical toward the second side 44 of the middle portion 30 as is most clearly shown in FIG. 5. The fifth part 60 is generally L-shaped. The sixth part 62 extends downwardly from the fifth part 60 toward the top edge 40 of the middle portion 30. When the contact 26 is not deformed as shown in FIGS. 2-5 and 8, the sixth part 62 is generally parallel to the middle portion 30, but in a plane offset from the plane containing the middle, or fixed portion, of the contact 26. As is best illustrated in FIG. 2, the width of the first, second and third parts 52, 54, 56 is consistent along their lengths; the width of the fourth part 58 along its length tapers downwardly from the third part 56 to the fifth part 60; and the width of the fifth part 60 is consistent along its length. The sixth part 62 has a width that is wider than the fifth part 60 such that an enlarged tip is formed relative to the fifth part 60. The fifth part 60 is the portion of the contact 26 which will be in contact with the mating component, such as a contact pad on a printed circuit board 63. The upper portion 28 of the contact 26 can be deformed relative to the middle and lower portions 30, 32 by applying a downward force to the fifth part 60 of the upper portion 28.

The housing 22 is formed of an insulative material, such as a plastic, and can be formed by molding. As such, the housing 22 can be economically manufactured. The housing 22 has a top or first surface 64 and a bottom or second surface 66. The passageways 24 extend from the top surface 64 to the bottom surface 66 of the housing 22. The structure of one of the passageways 24 is described herein with the understanding that the other passageways 24 are identically formed. The passageway 24 is formed from a first or upper portion 68 which extends downwardly from the top surface 64 of the housing 22 and a second or lower portion 70 which extends from the upper portion 68 to the bottom surface 66 of the housing 22.

As shown in FIG. 2, the contact 26 is mounted in the passageway 24 such that the lower and middle portions 30, 32 of the contact 26 are in the lower portion 70 of the passageway 24 and the upper portion 28 of the contact 26 is in the upper portion 68 of the passageway 24. The contact pad 34 is preferably flush with the bottom surface 66 of the housing 22. In the undeformed position as shown in FIGS. 2 and 8, the fourth and fifth parts 58, 60 and a portion of the tip 62 of the contact 26 extend upwardly from the top surface 64 of the housing 22; and the remainder of the tip 62 is provided within the passageway 24.

The upper portion 68 of the passageway 24 has a predetermined height, width and depth. The height, width and depth of the upper portion 68 is such that it accommodates the upper portion 28 of the contact 26 therein when the upper portion 28 is deformed such that the fifth portion 60 is flush with the top surface 64 of the housing 22 as shown in FIG. 9. The width and depth of the upper portion 28 is dimensioned such that it accommodates the first through fifth parts 52, 54, 56, 58, 60, 62. A recess 72 is provided in the upper portion 68 of the passageway 24 in which the sixth part or tip 62 is provided. The recess 72 has a first wall 74 which is generally parallel to the tip 62 when the contact 26 is in an undeformed position, and second and third walls 76, 78 which are perpendicular to the first wall 74 and connected to the first wall 74 at opposite ends thereof. The recess 72 opens into the remainder of the upper portion 68. The recess 72 is dimensioned such that width is slightly larger than the width of the tip 62 as is best illustrated in FIG. 1. The provision of the enlarged tip 62 allows the housing 22 to be more economically manufactured because the enlarged area of the recess 72 allow for easier molding of the passageways 24.

As discussed, when the contact 26 is in the undeformed position as shown in FIG. 2-5 and 8, the fourth and fifth parts 58, 60 and a portion of tip 62 of the contact 26 extend upwardly from the top surface 64 of the housing 22; and the remainder of the tip 62 is provided within the recess 72. When a downward force is placed on the contact 26 by a mating component 63 contacting the fifth part 60 of the contact 26, the upper portion 28 deforms relative to the middle and lower portions 30, 32 as is shown in FIG. 9. The upper portion 28 will deform until the fifth part 60 is flush with the upper surface 64 of the housing 22. If the force on the fifth part 60 is directly downward, the upper portion 28 of the contact 26 only moves vertically and does not move laterally. If, however, the force on the fifth part 60 is not directly downward and is slightly angled relative to the vertical, the upper portion 28 of the contact 26 will move laterally. In this situation, the recess 72 prevents the plastic deformation of the contact 26 while allowing for elastic deformation of the contact 26. When a force that is angled relative to the vertical is placed on the contact 26, the tip 62 will move laterally within the recess 72 until the tip 62 contacts one of the side walls 76, 78 of the recess 72. Thus, the tip 62 acts as a guide. The contact of the tip 62 with the wall 76, 78 prevents the tip 62 will from moving laterally further. As a result of this construction, the upper portion 28 can move laterally a predetermined amount, but is prevented from moving laterally to the extent that plastic deformation of the contact 26 would occur. In addition, because the tip 62 is enlarged relative to the fourth part 60 which is the portion that contacts the mating

component 63, a more robust contact is provided because the tip 62 can more readily absorb the impact with the walls 76, 78 of the recess 72 without deformation.

VI. ISSUES ON APPEAL

The issues on appeal are:

(a) whether claims 1-5 and 17 are anticipated under 35 U.S.C. § 102(b) by United States Patent No. 6,315,621 ("Natori et al")

(b) whether claims 6, 7 and 9-16 are rendered obvious under 35 U.S.C. § 103(a) by Natori et al in view of United States Patent No. 6,688,893 ("Huang et al"); and

(c) whether claim 8 is rendered obvious under 35 U.S.C. § 103(a) by Natori et al.

VII. GROUPING OF CLAIMS

In rejecting the claims, the Examiner has grouped the rejected claims in three groups. Group 1 consists of claims 1-5 and 17, group 2 consists of claims 6, 7 and 9-16 and group 3 consists of claim 8. Claim 1 would be representative of the first group of claims, claim 6 would be representative of the second group of claims and claim 8 would be representative of the third group of claims.

VIII. ARGUMENT

1. Claims On Appeal

All of the claims involved in this Appeal were finally rejected in the Official Action of December 29, 2005 because the Examiner maintained that claims 1-5 and 17 were anticipated under 35 U.S.C. § 102(b) by United States Patent No. 6,315,621 ("Natori et al"), claims 6, 7 and 9-16 were rendered obvious under 35 U.S.C. § 103(a) by the combination of Natori et al and United States Patent No. 6,688,893 ("Huang et al") and claim 8 rendered obvious under 35 U.S.C. § 103(a) by Natori et al. It is the final rejection of those claims that

resulted in the filing of this Appeal.

The claims on appeal are set forth in Appendix A. These claims recite various embodiments of a land grid array connector. The claim indicated to be representative of the first group of claims on appeal, *i.e.*, claim 1, recites a land grid array connector. The land grid array connector comprises a housing and a conductive contact. The housing has a first surface and a second surface. In addition, the housing has a passageway provided therethrough which extends from the first surface to the second surface. The passageway has a recess proximate to the first surface of the housing. The conductive contact is received within the passageway, the contact having a deformable portion having a tip provided at an end thereof. The deformable portion is capable of being in an undeformed position and in a deformed position. At least a portion of the tip being provided within the recess when the contact is in an undeformed position, at least a portion of the tip being provided within the recess when a lateral force is placed on the contact to deform the deformable portion, the recess being sized and configured to limit lateral deflection of the tip upon deformation of the deformable portion in a lateral direction.

Claim 6, which is representative of the second group of claims, recites a land grid array connector of claim 1, wherein the contact is generally S-shaped.

Claim 8, which is the only claim in the third group of claims, recites a land grid array connector of claim 1, wherein the contact has a thickness of approximately .003 inches.

2. The Cited References

The Examiner relied on two references in rejecting the appealed claims: United States Patent No. 6,315,621 ("Natori et al") and United States Patent No. 6,688,893 ("Huang et al").

A. United States Patent No. 6,315,621 ("Natori et al"):

Natori et al discloses an electrical connector contact element having multi-contact points to come into contact with a single mating contact element with independent contacting forces. The contact element 51 comprises a fixing portion 53 to be fixed to an insulator, and elastic arm portion 55 connected to one end of the fixing portion 53, a contacting elastic portion or an elastic contact portion 57 connected to the elastic arm portion 55, and a terminal portion 59 connected to the other end of the fixing portion 59. The elastic arm portion 55 connects the fixing portion 53, and a curved section 63. Specifically, the curved section 63 has a primary separate piece or section 81 and a subsidiary separate piece or section 83. The contacting elastic portion 57 has a primary and subsidiary finger portion. The primary finger portion comprises two sections corresponding to two legs of V-shape, that is a first primary leg section 85 connected to one end of the primary separate section 81 and a second primary leg section 86 connector to one end of the first primary leg section 85. The subsidiary finger portion comprises a first subsidiary leg section 87 connected to one end of the subsidiary separate section 83 and a second subsidiary leg section 88 connected to one end of the first subsidiary leg section 87. The first and second primary leg sections 85 and 86 form a generally inverted-V shape.

The contact element 51 is fixed to an insulator 230 to form an electrical connector. The insulator 230 has a shape of a hollow box. Within the insulator 230, the fixing portion 53 of the contact element 51 is press-fitted into a vertical wall 231 of the insulator to be fixedly supported. The elastic arm portion 55 is received in a cavity 233 of the insulator to be freely deformable and displaceable. The most part of each of the first and second primary leg sections 85 and 86 and the first and second subsidiary leg sections 87 and 88 protrude outward from an upper surface of the insulator 230 except the opposite ends thereof, i.e., the both ends of the contacting elastic portion 57. The free ends of the second primary leg section 86 and the second subsidiary leg section 88 are slightly inserted into the

cavity 233 to be freely moveable.

B. United States Patent No. 6,688,893 ("Huang et al"):

Huang et al. discloses an electrical connector having high performance contacts. Applicants do not dispute that the contacts 12 are generally S shaped.

3. The Rejection Under 35 U.S.C. § 102(b) Of Claims 1-5 and 17 Should Be Reversed

In the final Official Action of December 29, 2004, the Examiner asserted that claims 1-5 and 17 were anticipated under 35 U.S.C. § 102(b) by United States Patent No. 6,315,621 ("Natori et al"). A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegall Bros. v. Union Oil Co. of Calif.*, 814 F.2d 628, 631 (Fed. Cir. 1987). Because Natori et al does not recite each and every element set forth in claims 1-5 and 17, Natori et al does not anticipate the subject matter recited in those claims, and the Board should reverse the Examiner's 35 U.S.C. 102(b) rejection.

Representative claim 1 recites a land grid array connector. The land grid array connector comprises a housing and a conductive contact. The housing has a first surface and a second surface. In addition, the housing has a passageway provided therethrough which extends from the first surface to the second surface. The passageway has a recess proximate to the first surface of the housing. The conductive contact is received within the passageway, the contact having a deformable portion having a tip provided at an end thereof. The deformable portion is capable of being in an undeformed position and in a deformed position. At least a portion of the tip being provided within the recess when the contact is in an undeformed position, at least a portion of the tip being provided within the recess when a lateral force is placed on the contact to deform the deformable portion, the recess being sized and configured to limit lateral deflection of the tip upon deformation of the deformable

portion in a lateral direction.

Natori et al discloses that "the free ends of the second primary leg section 86 and the second subsidiary leg section 88 [of the contact element 51] are slightly inserted into the cavity 233 ***to be freely moveable.***" (Natori et al, col. 5, line 66 to col. 6, line 2 (emphasis added)). As Natori et al teaches that the free end of the contact element are to be freely moveable, it cannot also teach that the recess for receiving the tip of the contact be sized and configured to limit lateral deflection of the tip of the contact upon deformation of the deformable portion in a lateral direction. Accordingly, for at least the above reason, the Examiner erred in rejecting claims 1-5 and 17 under 35 U.S.C. § 102(b) as being anticipated by Natori et al.

4. The Rejection Under 35 U.S.C. § 103(a)
Of Claims 6, 7 and 9-16 Should Be Reversed

In the final Official Action of December 29, 2004, the Examiner asserted that claims 6, 7 and 9-16 were obvious under 35 U.S.C. § 103(a) by the combination of United States Patent No. 6,315,621 ("Natori et al") and United States Patent No. 6,688,893 ("Huang et al"). Because the combination of Natori et al and Huang et al does not set forth every element of claims 6, 7 and 9-16, the combination of Natori et al and Huang et al does not present a *prima facie* case of obviousness, and the Board should reverse the Examiner's 35 U.S.C. 103(a) rejection.

Representative claim 6 recites a land grid array connector of claim 1, wherein the contact is generally S shaped. Because Natori et al does not anticipate claim 1 for at least the reasons set forth in section VIII, 3, above, the combination of Natori et al and Huang et al cannot establish a *prima facie* case of obviousness as it relates to representative claim 6. As such, the combination of Natori et al and Huang et al does not render claims 6, 7 and 9-16 obvious, and applicants respectfully request that the Board reverse the Examiner's 35 U.S.C.

§ 103(a) rejection of claims 6, 7 and 9-16.

5. The Rejection Under 35 U.S.C. § 103(a) Of Claim 8 Should Be Reversed

In the final Official Action of December 29, 2004, the Examiner asserted that claim 8 was rendered obvious under 35 U.S.C. § 103(a) by United States Patent No. 6,315,621 ("Natori et al"). Because Natori et al does not disclose, teach or suggest every element of claim 8, it does not present a *prima facie* case of obviousness, and the Board should reverse the Examiner's 35 U.S.C. 103(a) rejection.

Representative claim 8 recites a land grid array connector of claim 1, wherein the contact has a thickness of approximately .003 inches. Because Natori et al does not anticipate claim 1 for at least the reasons set forth in section VIII, 3, above, it cannot establish a *prima facie* case of obviousness as it relates to claim 8. As such, Natori et al does not render claim 8 obvious, and applicants respectfully request that the Board reverse the Examiner's 35 U.S.C. § 103(a) rejection of claim 8.

IX. CONCLUSION

For the above reasons, it is respectfully submitted that the appealed claims do define a land grid array connector that is not disclosed in or suggested by the relied upon references, whether taken alone or combined as suggested by the Examiner. Accordingly, it is respectfully submitted that the Examiner's rejection of the claims on appeal should not be sustained and therefore should be reversed.

Respectfully submitted,
MOLEX INCORPORATED

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APPENDIX A

1. A land grid array connector comprising:

a housing having a first surface and a second surface, the housing having a passageway provided therethrough which extends from the first surface to the second surface, the passageway having a recess proximate to the first surface of the housing; and

a conductive contact received within the passageway, the contact having a deformable portion having a tip provided at an end thereof, the deformable portion being capable being in an undeformed position and in a deformed position, at least a portion of the tip being provided within the recess when the contact is in an undeformed position, at least a portion of the tip being provided within the recess when a lateral force is placed on the contact to deform the deformable portion, the recess being sized and configured to limit lateral deflection of the tip upon deformation of the deformable portion in a lateral direction.

2. A land grid array connector as defined in claim 1, wherein the tip of the deformable portion has enlarged portion having a predetermined width.

3. A land grid array as defined in claim 2, wherein the recess has a width that is slightly larger than the width of the enlarged portion.

4. A land grid array connector as defined in claim 1, wherein the tip is provided at a first end of the contact, and a contact pad is provided at a second end of the

contact.

5. A land grid array as defined in claim 4, wherein the contact pad is flat and flush with the second surface of the housing.

6. A land grid array connector as defined in claim 1, wherein the contact is generally S-shaped.

7. A land grid array connector as defined in claim 6, wherein the tip of the deformable portion has an enlarged portion.

8. A land grid array connector as defined in claim 1, wherein the contact has a thickness of approximately .003 inches.

9. A land grid array connector as defined in claim 1, wherein a plurality of passageways in the housing and a plurality of contacts are provided, respective ones of the contacts being mounted within respective ones of the passageways.

10. A land grid array connector as defined in claim 9, wherein the passageways and the contacts are provided in the housing in a high-density arrangement.

11. A land grid array connector as defined in claim 9, wherein each the tip has enlarged portion having a predetermined width.

12. A land grid array as defined in claim 11, wherein each the recess has a width that is slightly larger than the width of respective ones of the enlarged portions.

13. A land grid array connector as defined in claim 9, wherein each the tip is provided at a first end of the respective contact, and a contact pad is provided at a second end of the respective contact.

14. A land grid array as defined in claim 13, wherein each the contact pad is flat and flush with the second surface of the housing.

15. A land grid array connector as defined in claim 9, wherein each the contact is generally S-shaped.

16. A land grid array connector as defined in claim 15, wherein each the tip has an enlarged portion.

17. A land grid array connector as defined in claim 1, wherein each contact includes a deformable portion and a fixed portion, the deformable portion being laterally offset from the fixed portion.